UNIVERSITY OF ALBERTA

Department of Biological Sciences
Faculty of Science

CW 405 Biological Sciences Building
Edmonton, Alberta, Canada T6G 2E9

www.biology.ualberta.ca

General Office Tel: 780.492.3308
Fax: 780.492.9234
Student Service Tel: 780.492.3484
Fax: 780.492.9457

3 April 2013

Honorable Keith Ashfield
Minister of Fisheries and Oceans
Parliament Building
Wellington Street
Ottawa, ON
K1A 0A6

Honorable Peter Kent
Minister of Environment
401 Confederation Building
House of Commons
Ottawa, ON
K1A 0A6

Dear Ministers Ashfield and Kent:

Recent publications have revealed some remarkable similarities in the problems suffered by fish in the Athabasca River, and following the Deepwater Horizon and Exxon Valdez oil spills in the Gulf of Mexico and the Gulf of Alaska, respectively. These problems have not been a part of the public debate over the safety of extraction and transport of petrochemicals, yet they are important to the health of marine and freshwater fisheries.

The Deepwater Horizon oil spill in the Gulf of Mexico has caused dramatic increases in the incidence of malformations in fish and crustaceans, as described in the attached: http://oceansnrg.com/2013/03/18/gulf-seafood-deformities-alarm-scientists/

Similar observations were made after the Exxon Valdez oil spill in the Gulf of Alaska (Carls et al. 1998), as well as in the vicinity of heavy industries on the Great Lakes (Karrow et al. 2003).

Remarkably similar malformations occur downstream of the oil sands region of the Athabasca River, where both our university studies and those of the Alberta Regional Aquatic Monitoring Program (RAMP) have found high incidences of abnormalities in fish (see attached photos of some of our specimens taken in 2009 and 2010). According to local people, these began occurring in the 1990s. Investigations by both DFO during the AOSERP studies (Bond and Machniak 1979a,b) and private consultants (McCart et al. 1982) do not record malformations in fish in the early decades of oil sands mining, confirming these observations. It seems that some threshold for exposure has been reached.

Given the parallels in the cases from various locations, it seems likely that some chemical or suite of chemicals in crude oil is causing the malformations. The most likely suspects are probably polycyclic

aromatic hydrocarbons (PAHs), their alkylated derivatives, or closely related dibenzothiophenes. Some of these compounds are known or suspected carcinogens, mutagens or teratogens, while the toxicity of others is largely unknown. Physiological studies also implicate polycyclic aromatic hydrocarbons (PAHs), which are known to cause immune suppression. In the Gulf, the result has been that many fish species have become vulnerable to a broad suite of bacterial and viral diseases and myxosporidian parasites (Dr. James Cowan, Louisiana State University, personal communication). High concentrations of PAHs are also associated with the appearance of lesions in red snapper. Other suspect chemicals in the oil sands may include dissolved compounds found in oil sands processing waters, such as naphthenic acids. In the Gulf, chemical dispersants may also be involved.

In both the Gulf of Mexico and the Athabasca River, the high incidence of malformations and the grotesque appearance of some of the fish make consumers reluctant to eat them. In the Athabasca River, a subsistence fishery of importance to thousands of downstream users is at risk, and there are already complaints about the high incidence of malformations. In the Gulf, the commercial fishery is under threat.

Environment Canada and university scientists have also documented high mortalities of fish embryos from the oil sands hatched on bitumen-rich substrates, with high incidence of malformations in the survivors (Colavecchia et al. 2004, 2007). While in the lower Athabasca River, PAHs and related contaminants occur naturally, the recent high frequency of malformations suggest that industrial inputs have caused some threshold for malformations to be crossed. This seems unlikely in the mainstem river, but it may be occurring in some of the fish-bearing tributaries where watersheds are heavily mined, such as the Muskeg River. This river has an important fishery in its own right (Bond and Machniak (1979a).

While Environment Canada scientists are now doing an excellent job of monitoring the river, it will be impossible to determine which chemicals are responsible for the malformations in the complex chemical soup that occurs downstream of oil sands mining. **A more expeditious way of identifying them would be whole ecosystem experiments where small amounts of selected chemicals are applied to whole lakes, and effects determined on several key species in the food chain. Short term, laboratory studies are unsuitable, because to protect whole ecosystems, it is the response to long-term, chronic exposure that we must know.** Once the chemicals are identified, engineering solutions to eliminate them can be sought, but first we must know what they are.

The Experimental Lakes Area in northwestern Ontario (ELA) is ideal for such a purpose. **I propose that the ELA site and laboratory should be kept open to conduct these important experiments, which have implications for future effects of oil extraction and transport in or near both marine and freshwater ecosystems. I am copying this letter to selected Canadian and American scientists who are familiar with the chemistry and toxicity of petroleum products. You may want to discuss the topic with them, as well as the authors of the attached references. I am also copying it to selected media, because it is an issue that must be addressed in the ongoing public debate over the safety of petroleum extraction and transport.**

Sincerely,

D.W. Schindler, OC, AOE, DPhil, FRSC, FRS

Killam Memorial Chair and Professor of Ecology

cc.

Hon. Diana McQueen ESRD.Minister@gov.ab.ca

dan.wicklum@cosia.ca

fred.wrona@ec.gc.ca

derek.muir@ec.gc.ca

peter.hodson@queensu.ca

jwsosa@gmail.com

jhcowan@lsu.edu

jgiesy@aol.com

nvanderklippe@globeandmail.com

Clifford.krauss@NYTimes.com

tspears@ottawacitizen.com

taudette@edmontonjournal.com

kcryderman@calgaryherald.com

mdesouza@postmedia.com

bruce.cheadle@thecanadianpress.com

margo.mcdiarmid@cbc.ca

References cited

Bond, W., and Machniak, K., 1979a, An intensive study of the fish fauna of the Muskeg River watershed of northeastern Alberta, Alberta Oil Sands Environmental Research Project, project 4.5.1, Edmonton, Alberta, 178 p.

Bond,W., and Machniak, K., 1979b, An intensive study of the fish fauna of the Steepbank River watershed of northeastern Alberta, Alberta Oil Sands Environmental Research Project, project 4.5.2, Edmonton, Alberta, 196 p.

Carls, M.G., Marty, G.D., Meyers, T.R., Thomas, R.E., and Rice, S.D. 1998. Expression of viral hemorrhagic septicemia virus in prespawning Pacific herring (Clupea pallasi) exposed to weathered crude oil. Canadian Journal of Fisheries and Aquatic Sciences 55(10): 2300-2309.

Colavecchia, M.V., Backus, S.M., Hodson, P.V., and Parrott, J.L., 2004, Toxicity of oil sands to early life stages of fathead minnows (*Pimephales promelas),* Environ. Toxicol. and Chem., v.23, p. 1709-1718.

Colavecchia, M.V., Hodson, P.V., and Parrott, J.L., 2007, The relationships among CYP1A induction, toxicity, and eye pathology in early life stages of fish exposed to oil sands, J. Toxicol. and Environ. Health, A v. 70, p. 1542-1555.

Karrow, N.A., Bennie, D.T., Boermans, H.J., Bols, N.C., Dixon, D.G., Gamble, A., Ganassin, R., Parrott, J., Solomon, K.R., and Sherry, J.P. 2003. Effect of exposure to various sites within Hamilton harbour on Oncorhynchus mykiss pronephros macrophage function and B cell numbers. Journal of Great Lakes Research 29(2): 280-295

McCart, P., Tripp, D., and Withler, R., 1982, Spawning and distribution of lake whitefish (Coregonus clupeaformis) in Athabasca River and Lake Athabasca, Alberta Environment, Edmonton, AB, 38p. plus tables and figures.